NEW

VANOX

OLYMPUS RESEARCH MICROSCOPE

(Metallurgical Version)

MODEL **AHMT**

INSTRUCTION MANUAL FOR OBSERVATION AND PHOTOMICROGRAPHY

This instruction manual has been written for use of the Research Microscope (Metallurgical version) Model AHMT. It is recommended that you read the manual carefully in order to familiarize yourself fully with the use of this microscope so that you can obtain the best performance.
For the assembly of the microscope, read the assembly instructions provided with this microscope.

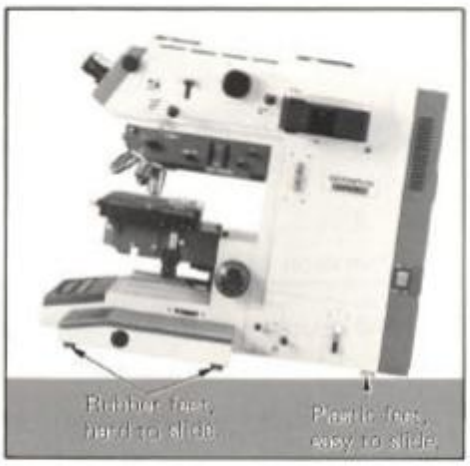
OLYMPUS

OBSERVE THE FOLLOWING POINTS CAREFULLY:

1. Operation

1) Since a microscope is a precision instrument, always handle it with the care it deserves, and avoid abrupt motions and impacts.
2) For movement of the microscope

a) On a bench



It is possible to move the microscope on a bench by tilting it gently by holding it in the front, and sliding it along the bench on its plastic feet.

b) To carry it over a long distance

One person holds the microscope base at the front ① and another at the back ② and carries the microscope.

3) Avoid exposure of the microscope to direct sunlight, high temperature and humidity, dust and vibration.
4) Make sure that the line voltage selector switch at the back of the microscope frame is set to conform to the local mains voltage.
5) Ground the microscope correctly.

2. Maintenance

1) Lenses must always be kept clean. Fine dust on lens surfaces should be blown off by means of a hand blower. Carefully wipe off oil or fingerprints on the lens surfaces with gauze moistened with a small amount of xylene or a mixture of alcohol (30%) and ether (70%).
2) Do not use organic solutions to wipe the surfaces of various components. Plastic parts, especially, should be cleaned with a neutral detergent.
3) Do not disassemble any part of the microscope.

HOW TO USE THE LIGHT EXCLUDING SHUTTER

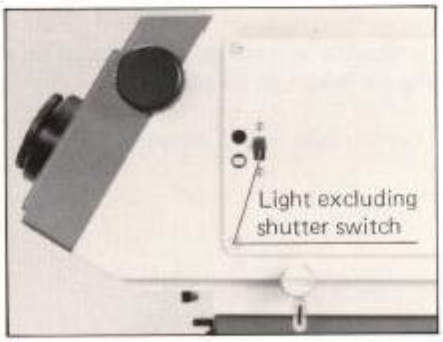
The Research Microscope Model VANOX-T (AHMT) features a unique light excluding shutter to prevent light, entering through the viewing eyepieces, from disturbing long photomicrographic exposures. This feature is especially valuable with overhead fluorescent illumination.

Operation of the shutter:

The shutter switch is located on the right hand side of the observation tube.

1) Turn the switch upward (to the ● position) during photography, then press the photo shutter release button (EXPOSE). No ambient light will go through the eyepieces. Conversely, the microscopic image cannot be observed while the light excluding shutter is engaged.

2) When the switch is turned downward (to the ○ position), the shutter is not engaged, and the microscopic image can be observed even during photographic exposure.



CONTENTS

1. SPECIFICATIONS 1 — 1

2. IDENTIFICATION AND FUNCTION OF VARIOUS COMPONENTS 2 — 2

3. OPERATING THE MICROSCOPE 6 — 3

3–1 Observation 6

A. Summary of Putting the Microscope in Operation ..... 6 — A

3–2 Photomicrography 13

◎ Identification and Function of the Various Controls on the Indication and Control Panels 13

B. Summary of 35 mm Photomicrography ..... 17 — B

C. Summary of Large Format Photomicrography ..... 23 — C

◎ Adapter for Large Format Camera Backs 24

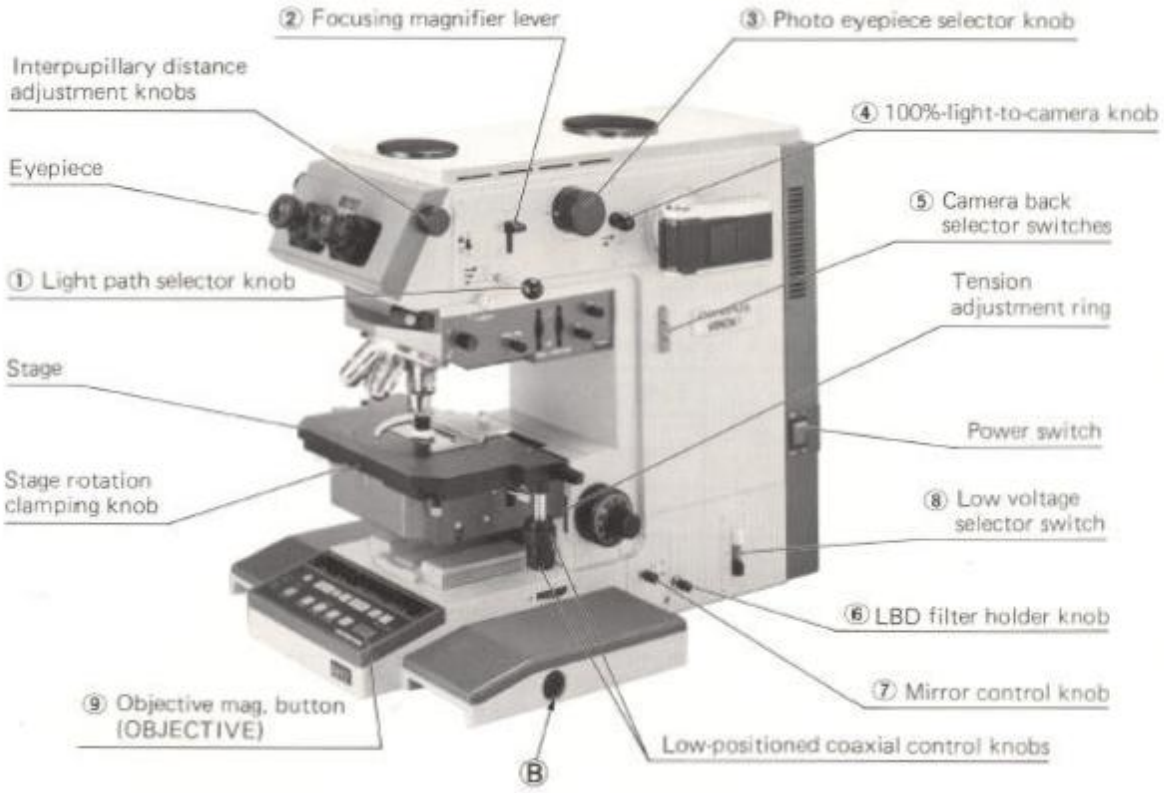
D. Special Applications ..... 33 — D

1 SPECIFICATIONS

Observation tube	Binocular tube with constant tube length adjustment. Tube inclination 30°. Interpupillary distance adjustment with scale range from 56 mm to 75 mm. Diopter adjustment range from −8 diop. to +2 diop. Standard eyepieces: Super widefield eyepieces SWHK10X. Field number 26.5.		
Revolving nosepiece	Quadruple, built on the vertical illuminator AH2-MA, motorized, for objective magnification change; with manual override.	Quadruple, built on the vertical illuminator AH2-RLA, motorized, for objective magnification change; with manual override.	
Stage	Mechanical square stage AH2-SVRM with right-hand low drive controls.		
Total magnification	(AHMT-513) For observation: 15X (Obj. 1.5X; Eyepiece 10X) to 1,500X (Obj. 150X; Eyepiece 10X). For photomicrography: 3.75X to 750X (35 mm film) 11.25X to 2,250X (large format film)	(AHMT-513NE) For observation: 50X (Obj. 5X; Eyepiece 10X) to 1,500X (Obj. 150X; Eyepiece 10X). For photomicrography: 12.5X to 750X (35 mm film) 37.5X to 2,250X (large format film)	
Illumination	Light source	Long life halogen bulb 12V, 100W (life time 2,000 hrs.) precentered.	
	Aperture and field iris diaphragms	Manually adjustable for each objective magnification change.	
	Filters	LBD filter and contrast filters (green, orange) built-in.	
	Light intensity control	Manually adjustable in 11 settings by means of ND filters built in.	
	Polarizer	Built-in.	
	Light path selection	Half-mirror built-in the illuminator AH2-MA for selection between incident light and transmitted light. Mirror built-in the illuminator AH2-RLA for selection between brightfield/darkfield; can be linked with ND filter.	
Photomicrographic equipment	Ports for mounting two 35 mm camera backs, a large format camera back and a TV camera simultaneously, up to 4 in all: with automatic light path selection. 4 photo eyepieces (2.5X, 3.3X, 4X and 5X) mounted on turret. Automatic exposure control system built-in (manual exposure is also possible). Exposure measurement selection between 30% integrated area and 1% spot area; real time measuring method, automatic compensation for reciprocity failure, automatic adjustment of exposure time for distribution or contrast of specimens; exposure time display (for estimated, recalled and remaining times); multiple exposures; automatic exposure time lock; frame counter, warning indication for over/under-exposure; film speed setting range from ISO/ASA 6 to 6400 (35 mm film) or from ISO/ASA 64 to 6400 (large format film); automatic film advance (35 mm film). Exposure of 35 mm frame divided in two halves by means of the half-size format slider (optional).		
Scale imprint	Micrometer insertion into the light path; 5 scales optionally available, including AH2-SLM10X, 20X, 40X, 50X and 100X.		
Focusing	Manual adjustment with built-in focusing magnifier for low magnification, Manual adjustment for high magnification.		

2 IDENTIFICATION AND FUNCTION OF VARIOUS COMPONENTS

The picture below illustrates the nomenclature of operating components for observation. (Descriptions of the photomircrographic components are given in the paragraph of "Photomicrography", page 13.)



① Light path selector knob (on the right hand side) . . . . . Deflects light as desired in 3 setting positions, with the left hand selector knob pushed in:

- Pushed in all the way . . . . . 40% of light for viewing the frame reticles; 40% to camera; 20% to photomultiplier.
- Pulled out halfway . . . . . 10% to binocular tube; 90% to TV/MEAS.
- Pulled out all the way . . . . . 100% to binocular tube.

② Focusing magnifier lever . . . . . Lower the lever to engage the magnifier.

③ Photo eyepiece selector knob . . . . . Clicks into position for photo eyepiece 2.5X – 3.3X – 4X – 5X.

④ 100%-light-to-camera knob . . . . . As pulled out all the way, directs 100% of light to the camera.

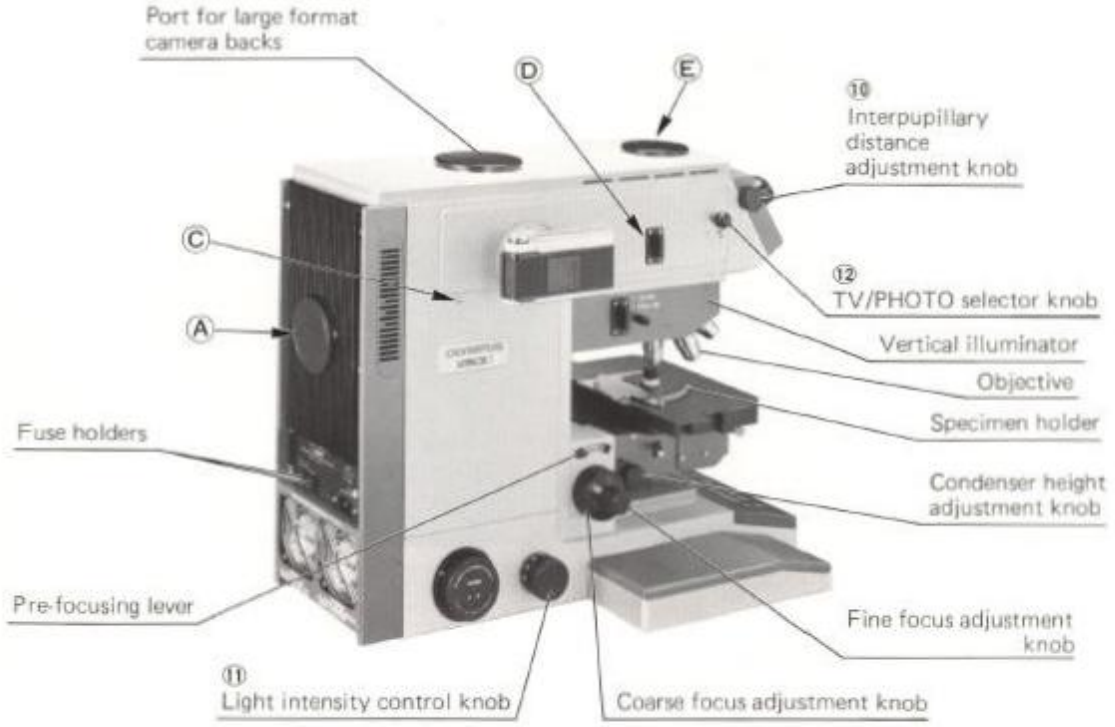
⑤ Camera back selector switches . . . . . Press the switch matching the camera back in use to deflect light to it. They are arrayed from the top: 35L (35 mm left), L (large format), 35R (35 mm right).

⑥ LBD filter holder knob . . . . . Push in the knob to engage the LBD filter.

⑦ Mirror control knob . . . . . Pushed in . . . . . reflected light.
Pulled out . . . . . transmitted light.

⑧ Low voltage selector switch . . . . . 3 setting positions: OFF – PHOTO (9 V) – MAX (12 V). Normally set to PHOTO.

⑨ Objective mag. button (OBJECTIVE) . . . Press the button to change objective magnification.



⑩ Interpupillary distance adjustment knob . . . . . Provided on both sides.

⑪ Light intensity control knob . . . . . Manually rotatable to change intensity in 11 settings from 100% to 0.1% by means of ND filters, in increments of 50%, at constant color temperature.

⑫ TV/PHOTO light path selector knob (2 positions) . . . . . Deflects light to TV/MEAS or to camera. Normally pushed in for camera. When pulled out directs the light to TV/MEAS.

Ⓐ through Ⓔ for various attachments:

Ⓐ . . . . . Mercury burner/Xenon light sources

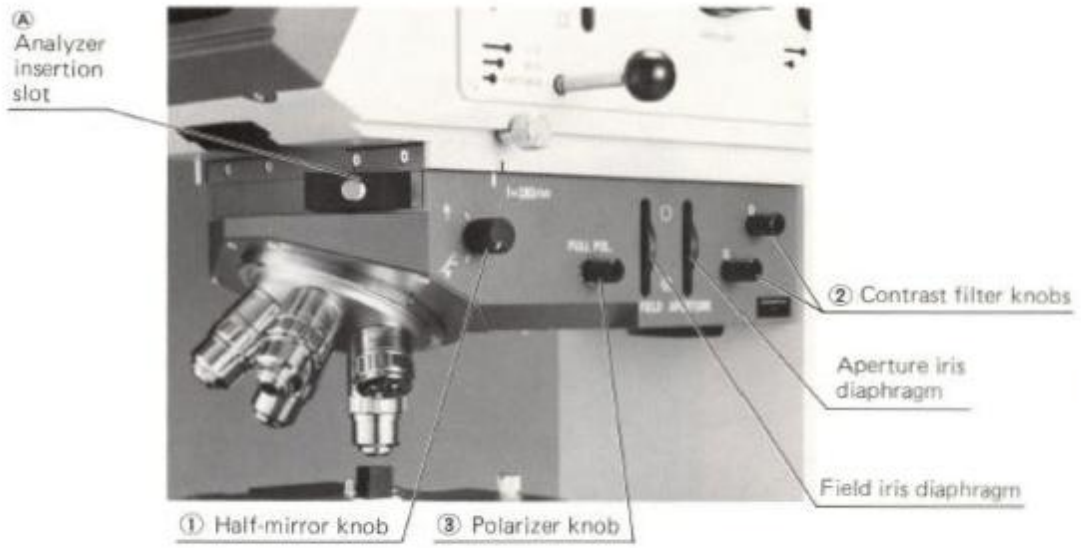
Ⓑ . . . . . Connector for attachment of optional hand switch

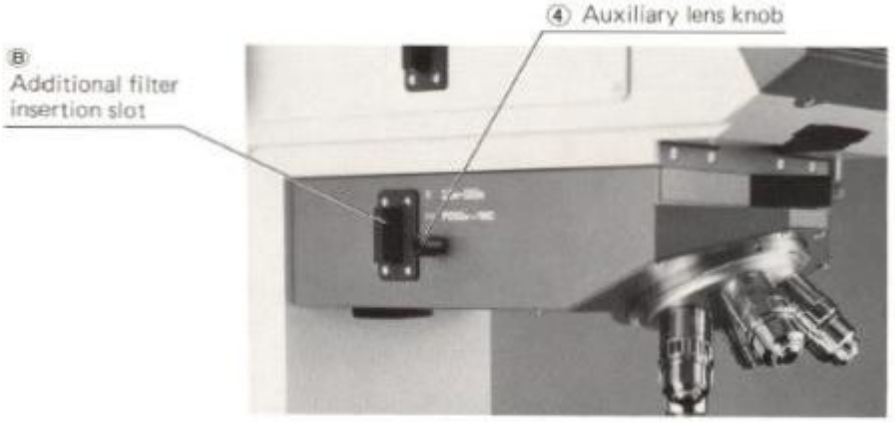
Ⓒ . . . . . X synchr. contact (for Olympus Recordata back)

Ⓓ . . . . . Reticle or Half-size frame slider

Ⓔ . . . . . TV/Light measurement port

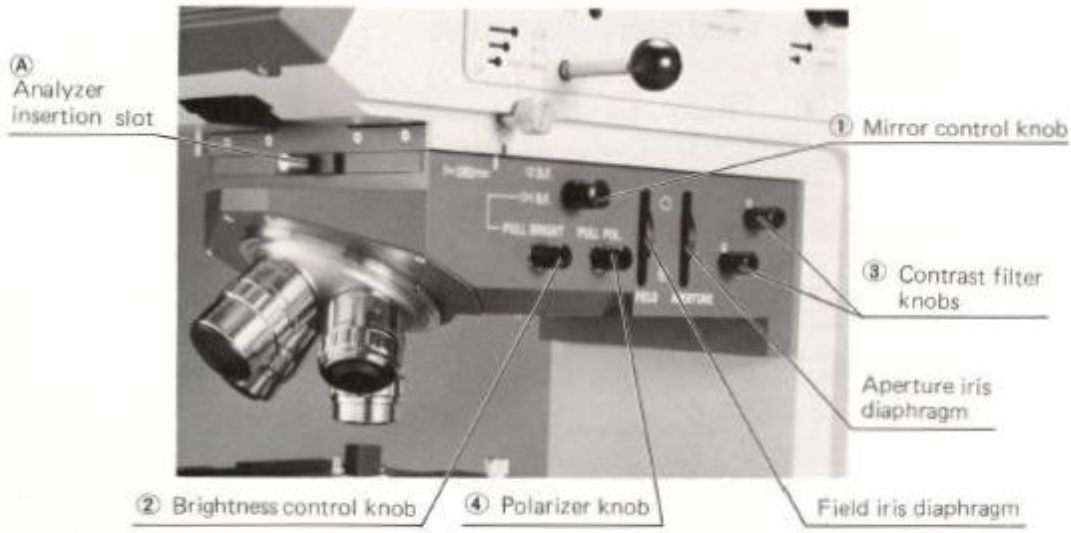
Vertical illuminator (for brightfield) AH2-MA

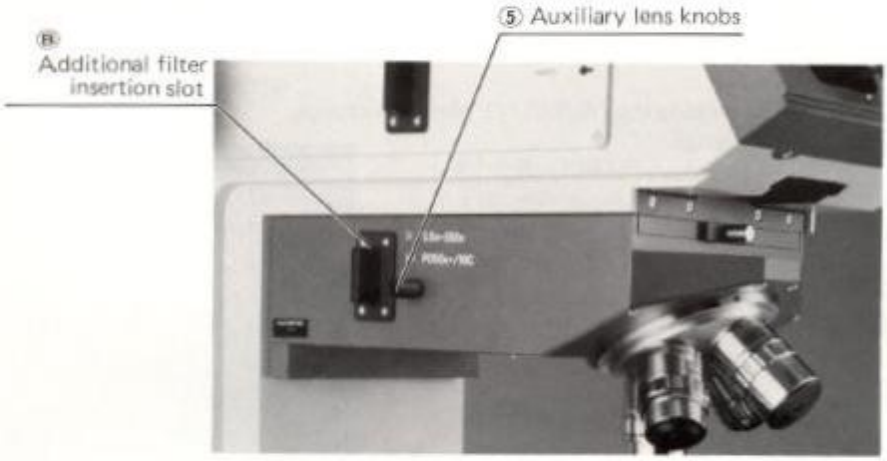




① Half-mirror knob	↓	for reflected light.
	↑	for transmitted light.
② Contrast filter knobs	Pulled out to engage the contrast filters:	
	G	green
	O	orange
③ Polarizer knob	Pulled out to engage the polarizer filter.	
④ Auxiliary lens knob	Normally pushed in. Pulled out for polarized light or differential interference observation with objectives 50X or higher.	
Ⓐ Analyzer insertion slot	Insert the analyzer provided.	
Ⓑ Additional filter insertion slot	Optional filters can be inserted.	

Vertical illuminator (for brightfield/darkfield) AH2-RLA





① Mirror control knob	Pushed in ... for darkfield Pulled out ... for brightfield
② Brightness control knob	Normally pushed in. Pull it out to increase light intensity in brightfield.
③ Contrast filter knobs	Pulled out to engage the contrast filters: G ..... green O ..... orange
④ Polarizer knob	Pulled out to engage the polarizer.
⑤ Auxiliary lens knob	Normally pushed in. Pulled out for polarized light or differential interference contrast with objectives 50X or higher.
Ⓐ Analyzer insertion slot	Insert the analyzer provided.
Ⓑ Additional filter insertion slot	Optional filters can be inserted.

3 OPERATING THE MICROSCOPE

3-1 Observation

A. Summary of Putting the Microscope in Operation

	Relevant section	(Page)
Switch on the light source.	① Power switch	(7)
Press the low voltage selector switch "PHOTO". Engage LBD filter.	Ⓐ Low voltage selector switch	(7)
Select the light path.	② Light path selector knobs	(7)
Place a specimen on stage.	③ Specimen holder	(8)
Engage the 10X objective. ★	④ Objective mag. button	(8)
Interpupillary distance adjustment.	Ⓑ Assembly instructions	(12)
Diopter adjustment.	Ⓒ Assembly instructions	(12)
Optical axis alignment.	Ⓒ Assembly instructions	(13)
Focus	⑤ Coarse & fine adjustments	(9)
Swing in desired objective. ★	④ Objective mag. button	(8)
Focus	⑤ Coarse & fine adjustments	(9)
Adjust the aperture and field iris diaphragms. ★	⑥ Aperture iris diaphragm	(11)
	⑦ Field irid diaphragm	(11)
Observation		

★ Make a point of pressing the OBJECTIVE button to change objective magnification.

★ Adjust light intensity accordingly.

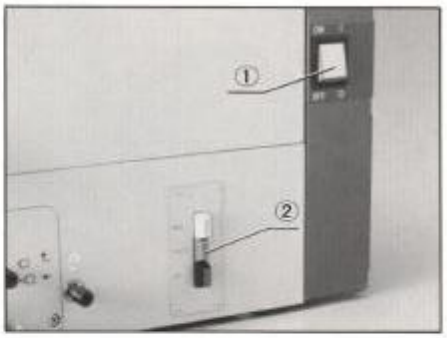


Fig. 1

1. Switching on the light source

1) Turn on the POWER switch ①. (Fig. 1)
2) Press the low voltage selector switch ② "PHOTO".

Low voltage selector switches	Application
MAX (12 V)	Dark field and differential interference contrast
PHOTO (9 V)	Normal observation, Photomicrography
OFF	When an external light source (high intensity) is used

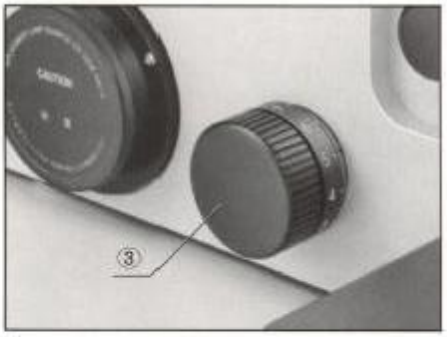


Fig. 2

3) Adjust light intensity by means of the light intensity control knob ③. (Fig. 2)
   ★ **Intensity can be varied in 11 steps from 0 (100%) to 10 (0.1%) in increments of 50%.**
   ★ **Be sure to click in the intensity control knob.**

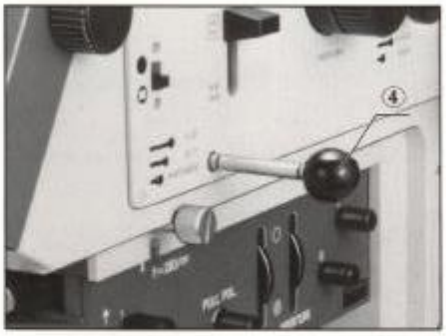


Fig. 3

2. Light path selection

1) For normal observation, pull out the right hand light path selector knob ④ halfway (BF.TV), and push in the left hand light path selector knob ⑤ all the way. (Fig. 3)
2) For other light path selections, follow the illustrations provided at the knob port, summarizing the usage of the knob;

Light path selector knob

- FL.DF . . . . . (Fluorescence/darkfield)
- BF.TV . . . . . (Brightfield/TV camera)
- PHOTO.MEAS . . . . . (Photomicrography/light measurement)

TV.PHOTO selector knob

- TV.MEAS . . . . . (TV camera/light measurement)
- PHOTO . . . . . (35 mm, large format camera)

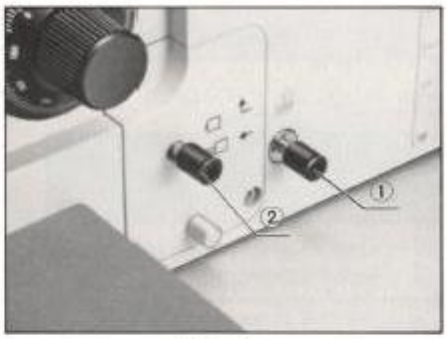


Fig. 4

3. Use of LBD filter and mirror control knob

1) The LBD filter is engaged or disengaged by means of the push-pull knob ①. For normal observation, engage the LBD filter. (Fig. 4)

2) Push in the mirror control knob ② for reflected light.

★ **For transmitted light, the mirror knob is pulled out.**

Fig. 5

4. Placing the specimen on the stage

1) Place the specimen ① in the specimen holder. (Fig. 5)

★ **Preparation of a specimen:**
Put plasticine ② on a metal slide ① provided; then place a specimen ③ on the plasticine and press the specimen with a hand press (optionally available) until the specimen surface is properly leveled.

Fig. 6

5. Engaging the 10X objective

Push the OBJECTIVE button ① until the 10X objective is engaged. (Fig. 6)

★ **Make a point of pressing this button whenever the objective magnification is changed.**

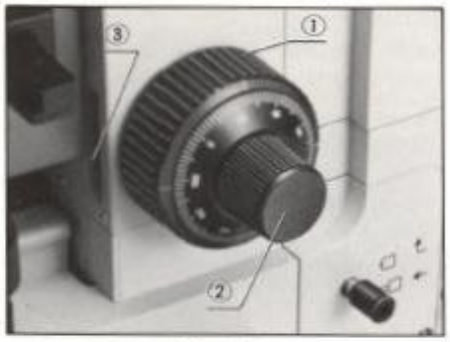


Fig. 7

6. Focusing

Bring the specimen into focus by means of the coarse ① and fine ② adjustment knobs. The coarse and fine adjustments affect vertical stage displacement. (Fig. 7)

Tension adjustment of coarse adjustment knobs

While the coarse adjustment motion is normally stiff and heavy, it is freely adjustable for either heavy or light movement depending on the observer's preference. To adjust the tension, turn the tension adjustment ring ③ in the direction of the arrow for heavy movement, or reverse the ring for light movement (Fig. 7) with a small screwdriver fitted into a hole in the ring.

Be careful not to loosen the tension adjustment ring too much, as this may cause a drop of the stage or the specimen to go out of focus after completing fine focus.

★ **Tension of the fine adjustment knobs cannot be adjusted.**

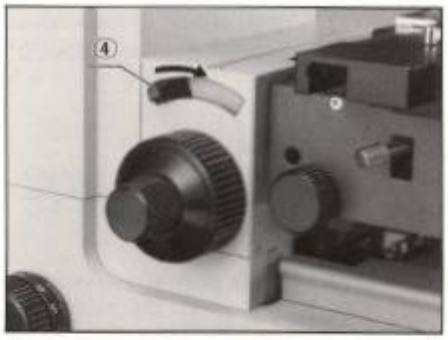


Fig. 8

Pre-focusing lever

This lever ④ is provided to prevent possible contact between specimen and objective as well as to simplify coarse focusing. (Fig. 8)

This lever is locked by turning it in the direction of the arrow after coarse focus has been accomplished. This prevents further upward travel of the stage and automatically provides a limiting stop if the stage is lowered and then raised again.

The pre-focusing lever does not restrict fine focusing.

7. **Interpupillary distance and diopter adjustments**

1) Push the right hand light path selector knob ① all the way to the PHOTO.MEAS position. (Fig. 9) (The left hand light path selector knob is kept pushed in all the way.)

Fig. 9

★ **A photo eyepiece of any magnification can be used for this adjustment, but the 2.5X photo eyepiece is convenient for the next adjustment because of its wider field of view than others. (Fig. 10)**

★ **Be sure to click in the photo eyepiece selector knob.**

Fig. 10

Fig. 11

2) Adjust the interpupillary distance.
Rotate the right or left side interpupillary distance adjustment knob ② until you can obtain a perfect binocular vision. (Fig. 11)

★ If you know your interpupillary distance, it is convenient to set it on the scale ③ located between the eyepiece tubes.

Fig. 12

3) Make diopter adjustment. Looking through one of the eyepieces, rotate the diopter adjustment ring ① to obtain a sharp image of the reticle. (Fig. 12)

★ Make sure that the double cross lines are clearly resolved as 2 lines.

★ Repeat the same adjustment on the other eyepiece.

Fig. 13

8. **Engaging the desired objective.**

1) Follow step 5 to swing in the desired objective.
2) For polarized light or differential interference contrast observation with objectives between 50X and 150X, pull out the auxiliary lens knob ①. (Fig. 13)

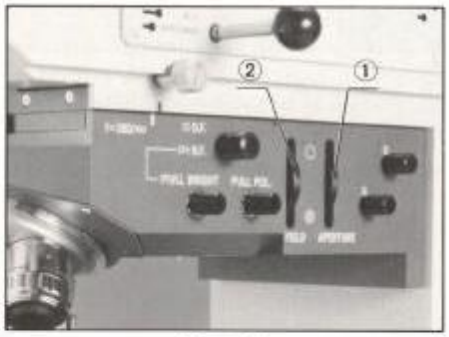


Fig. 14

9. **Adjustment of the field and aperture iris diaphragms**

1) Aperture iris diaphragm ① (Fig. 14)

- In order to achieve optimum objective performance, the opening of the aperture iris diaphragm should be matched to the numerical aperture of the objective in use.
  It is often preferable, however, to stop down the aperture diaphragm slightly more than indicated by the objective N.A., since microscope objects are generally low in contrast. (This will result in better image contrast, increased depth of focus and a flatter field.)
  ★ **Repeat this adjustment each time the objective is changed.**

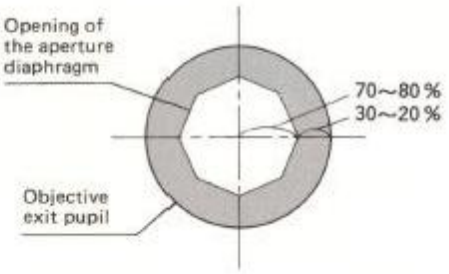
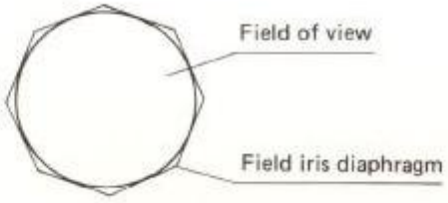


Fig. 15

- After completing focus adjustment, remove one of the eyepieces from the observation tube.
  Looking into the empty eyepiece tube, stop down the iris diaphragm so that the image of the iris diaphragm can be seen in the objective pupil as shown in Fig. 15.
- Generally, darkfield observation requires the maximum opening of the aperture diaphragm. That, however, varies, depending upon the specimen conditions for a better darkfield image with less glare.
- In case of darkfield observation, the objective exit pupil is not visible distinctly even by removal of the eyepiece; therefore, it is recommended to adjust the opening of the iris diaphragm while looking at the image of a specimen until you can obtain optimum image contrast and definition with minimum glares.



2) Field iris diaphragm ② (Fig. 14)
The field iris diaphragm controls the diameter of the ray bundle impinging on the specimen surface and therefore, by stopping down the field diaphragm until it is slightly larger than the field view, it will reduce stray light, which in turn increases image definition and contast.

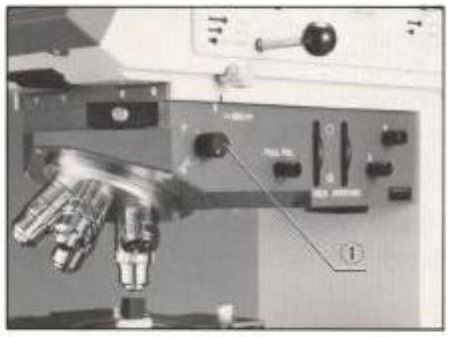


Fig. 16

10. **Light path selection**

1) Vertical illuminator AH2-MA:
In case of reflected light, turn the half-mirror knob ① to position ↓; in case of transmitted light, turn it to position ↑. (Fig. 16)
This light path selection requires the corresponding operation of the mirror control knob at the microscope base.

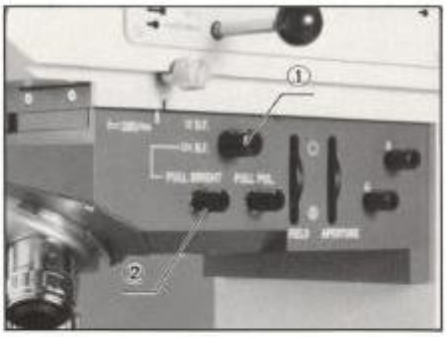


Fig. 17

2) Vertical illuminator AH2-RLA:
Push in the mirror control knob ① for darkfield, or pull it out for brightfield. The brightness control knob ② is normally pushed in, so that a built-in ND filter is engaged in brightfield to reduce the difference in light intensity at the time of transition from darkfield to brightfield. To increase the light intensity in brightfield, pull the knob out. (Fig. 17)

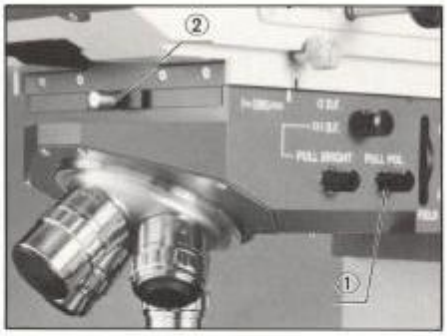
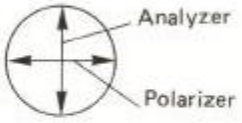


Fig. 18

11. Use of the polarizer

Pull out the polarizer knob ① to engage the polarizer. At this position, the polarizer vibration is in the east-west direction. Insert the analyzer into the analyzer insertion slot ②; at 0 setting, the analyzer vibration is in the north-south direction. (Fig. 18)



Crossed filters position

3-2 Photomicrography

O Identification and Function of the Various Controls on the Indication and Control Panels

(1) Indication panel

This panel is illuminated only when the light path selector knob is set to "PHOTO", and indicates that photomicrography is ready.

① **Camera indicator lights** . . Indicate the camera back to use:

35L . . . . . Left hand 35mm camera back

L . . . . . Large format camera back

35R . . . . . Right hand 35mm camera back

These lights are interlocked with the camera back selector switches on the microscope to indicate the camera in use.

② **Frame counter (FRAME)** . Indicates the number of frames exposed.

③ **Film speed (ISO/ASA)** . . . Indicates the film speed of film in the camera back in use.

④ **Reciprocity failure compensation (RECIPRO)** . . .

Compensates for the reciprocity failure characteristics of film in use.

★ **For details refer to the instruction sheet provided.**

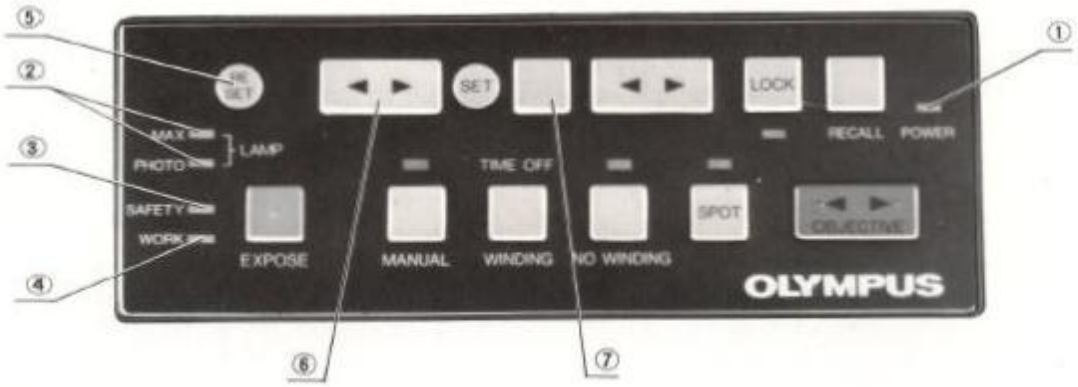
⑤ **Exposure adjustment (EXPOSURE ADJ.)** . . . . . .

Exposure time can be adjusted manually according to the distribution or contrast of the specimen, between 0.5X and 4X.

⑥ **Exposure time (EXPOSURE TIME)** . . . . . .

Estimated exposure time will be displayed in hours, minutes or seconds.

(2) Control panel



① **Power switch (POWER)** . . Lights up when switched on.

② **Intensity indicators (LAMP)** . . . . . .

MAX (yellow) : Maximum intensity for dark specimens.

PHOTO (green) : Normal setting for observation and photomicrography.

These indicators are interlocked with the low voltage selector switch to light up one at the time.

③ **SAFETY light** . . . . . Indicates by color whether the exposure time is within the limits of the automatic exposure range:

Green . . . . . correct exposure

Red (blinking) . . . . . overexposure (with intermittent warning tone for 3 sec.)

Red (continuous) . . . underexposure (with continuous warning tone for 3 sec.)

④ **WORK light** . . . . . Lights up only while the shutter is open.

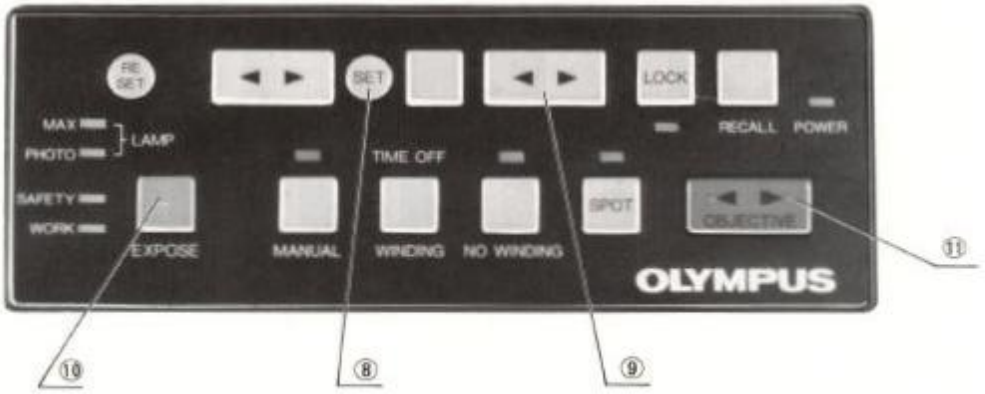
⑤ **RESET button** . . . . . Push this button to reset the frame counter to "1", after loading film.

⑥ **Film speed button** . . . . . Press the button to change the film speed indicator.

The button at the mark (◄) reduces the film speed in steps from 6400 to 6 (35 mm) or to 64 (large format). Pushing the button at the mark (►) increases the film speed in steps from 6 (or 64) to 6400. When changing the film speed, press the "SET" button while the film speed indicator blinks. This will enter the new film speed in the memory of the camera. If the "SET" button is not pressed, the film speed indicator will blink for 10 sec., then a warning tone will sound and the indicator readout will show the previously selected speed.

⑦ **Reciprocity failure compensation button** . . .

Compensates for the reciprocity characteristics of the film used. The indicator can be set in steps from 0 to 7. It stops blinking by pressing the SET button.



⑧ SET button . . . . . By pressing this button while the indicator of the film speed or reciprocity failure compensation is blinking, the indicated value is put into the camera memory. If this button is not pressed, the blinking will continue for 10 sec., then a warning tone will sound, and the indicator read-out will display the previously selected value.

⑨ Exposure adjustment button

Exposure time can be adjusted manually according to the distribution or contrast of the specimen. Read page 33 for detail.

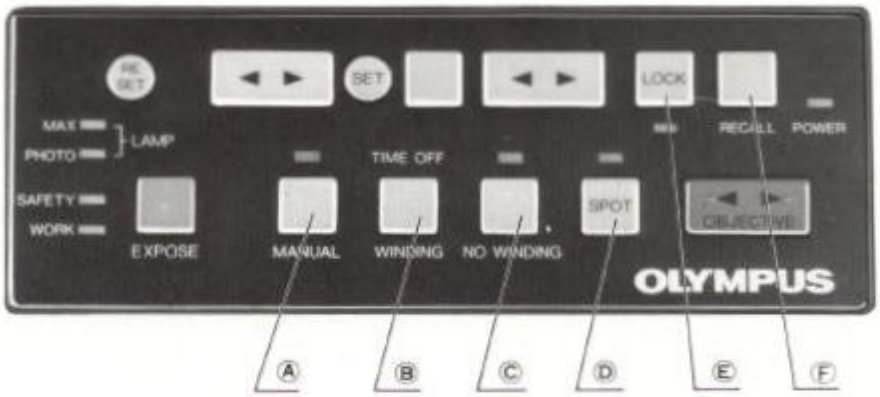
★ As there is no memory circuit for this button, it returns to 1X when reactivated.

⑩ Shutter release button (EXPOSE)

Activates the shutter. At the end of the exposure with a large format camera back or in the "NO WINDING" mode, a warning beep sounds.

⑪ Objective magnification button (OBJECTIVE)

Rotates the nosepiece in the direction of the arrow.



Other controls (Ⓐ through Ⓕ) for special applications:

Ⓐ Manual button (MANUAL)

Press this button for manual exposure.
As you press the shutter release button (EXPOSE) ⑩ , the shutter is opened, and the actual exposure time is displayed. To close the shutter, press the button "B" (TIME OFF).

Ⓑ Film advance button (TIME OFF/WINDING)

Closes the shutter and advances the film.
If the shutter is already closed, the film is advanced. After loading the film, use this button to wind 2 or 3 frames for blind shots.
If you press this button in the manual mode, the shutter is closed, and the film is advanced.

Ⓒ Multiple exposure button (NO WINDING)

Pressing this button closes the shutter without advancing the film. Use it for multiple exposures for full frame or half-frame photography. If you press this button twice, the multiple mode is released, and the automatic film advance is resumed.

Ⓓ Spot measurement button (SPOT)

The spot measurement area covers the 1% area of the 35mm film plane at the center of the field, convenient for darkfield, or specimens with large contrast differences; e.g. fluorescence, etc.

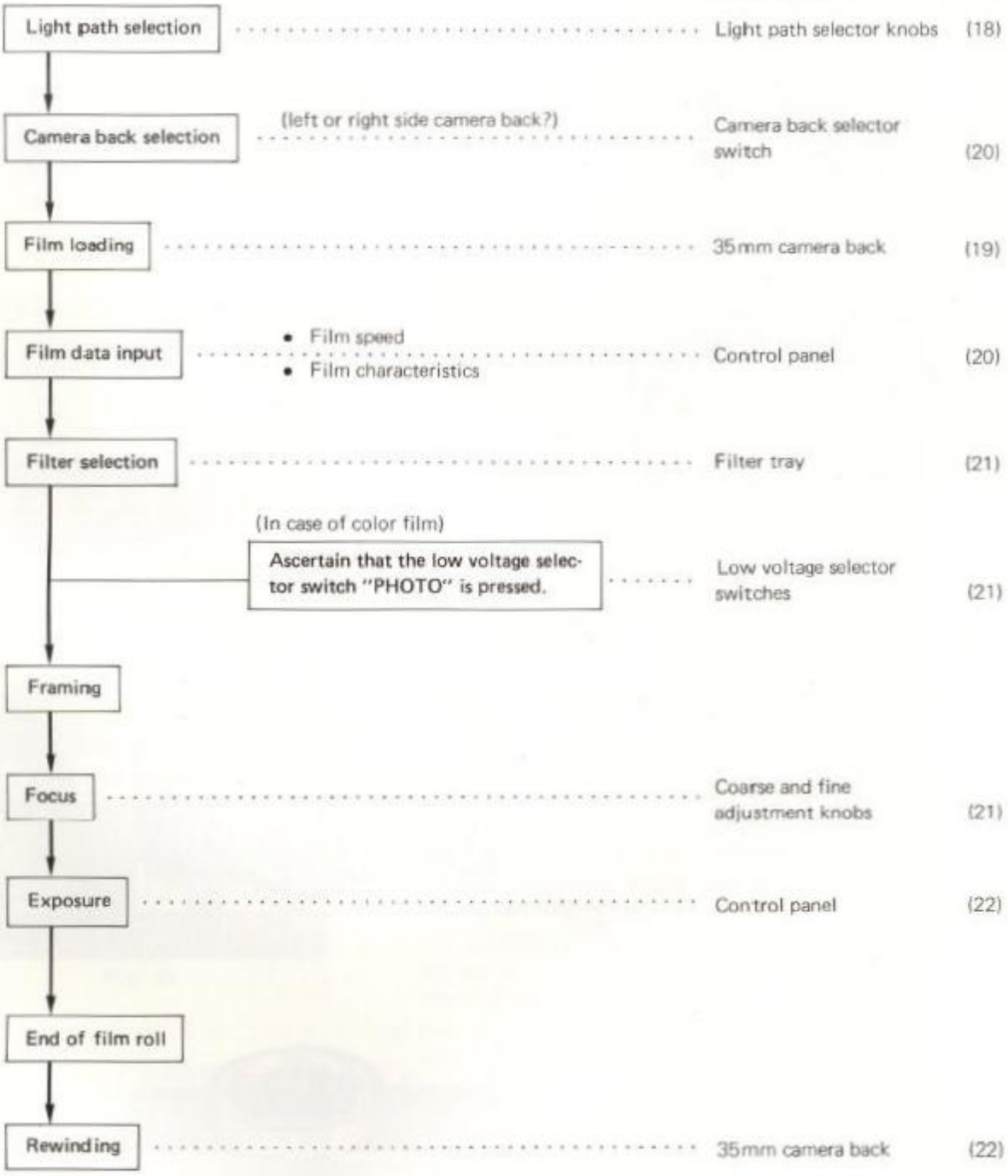
Ⓔ Automatic exposure lock button (LOCK)

Used to take photographs with the same exposure time on display.

Ⓕ Time recall button (RECALL)

The previously set exposure time is displayed by pressing this button.

B. Summary of 35 mm Photomicrography



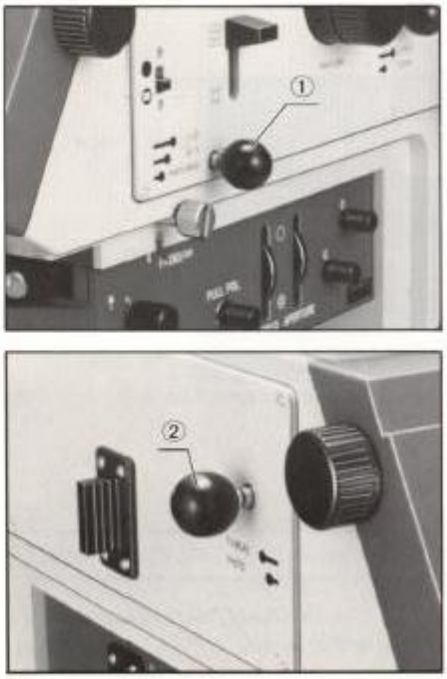


Fig. 19

1. Light path selection

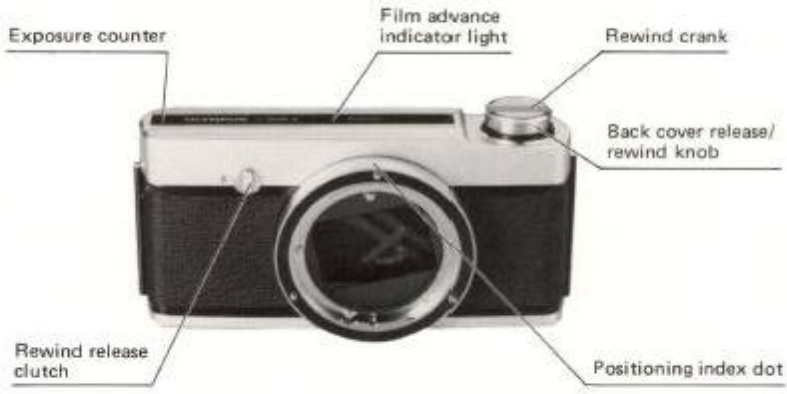
1) Push the right hand light path selector knob ① all the way into the "PHOTO.MEAS" position. (Fig. 19)

2) Push the left hand light path selector knob ② to the "PHOTO" position.

3) The format reticle appears in the field of view.

★ Read the paragraph of "Framing" for format sizes at page 21.

2. 35 mm film loading



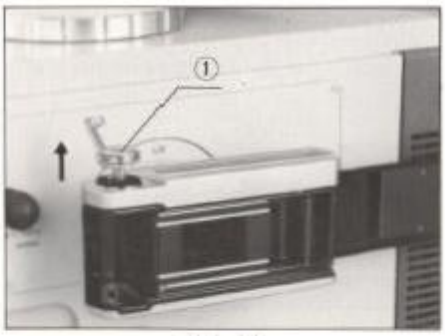


Fig. 20

1) Lift up the rewind crank ① folded into the rewind knob. A slight resistance may be felt before the back cover (hinged cover) snaps partially open. (Fig. 20)

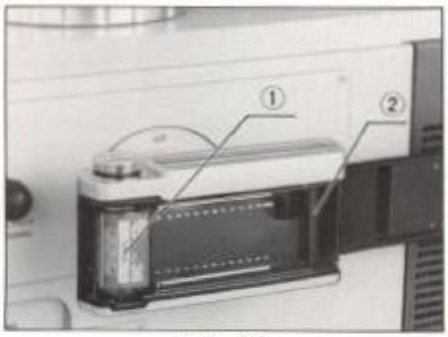
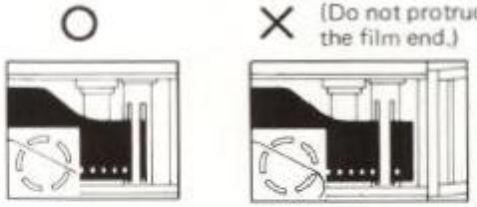


Fig. 21

2) Put the cartridge ① in the film chamber and push the rewind knob back into position. (Fig. 21)

3) Insert the film end into a slit on the take-up spool ② (Fig. 21) Watch that the end of the film does not protrude from the opposite side of the slit.



★ **If the film is loaded with the camera body detached, mount the camera back on the microscope. Keep the back cover opened.**

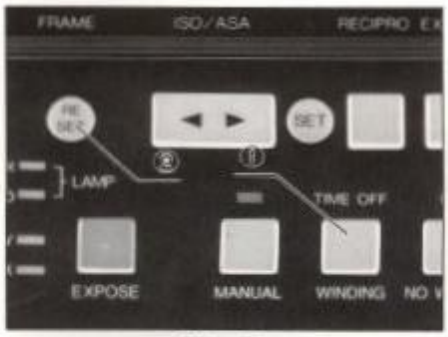


Fig. 22

4) Press the film advance button (TIME OFF/WINDING) ① (Fig. 22) on the control panel and advance the film until the film perforations engage the sprockets ③ on both sides. (Fig. 23) It is advisable to lightly put your finger tip on the sprocket gear.
The film is advanced by one frame each time the advance button is pressed.

5) Close the back cover and press until a click can be heard.

6) Press the film advance button again to advance the film (2 to 3 frames) until the number "1" appears in the exposure counter.

7) It is convenient to insert the end flap of the 35 mm film package into the memo holder provided on the camera back cover as a reminder of the type of film used.

8) Press the "RESET" button ② (Fig. 22) and the frame counter indicates "1".

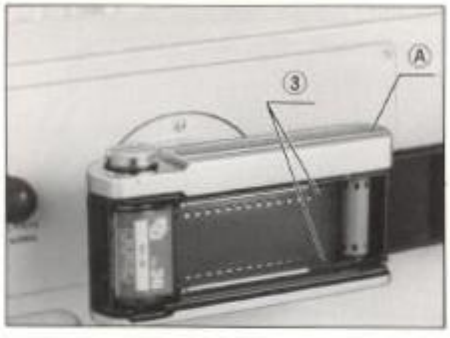


Fig. 23

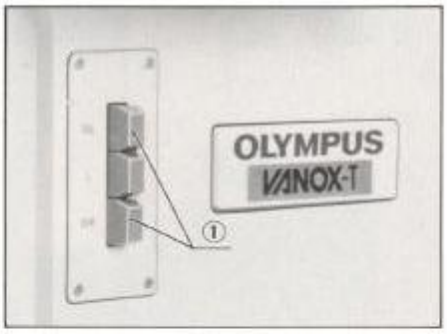


Fig. 24

3. Film data input

The film data, including ISO/ASA film speed, film characteristics, etc. are entered into the control panel.

1) Select the right or left 35 mm camera back.

Press the camera back selector switch "35R" or "35L" ①. (Fig. 24)

★ **Since film data are memorized according to the individual camera backs, be careful to remember for which side camera back the data are to be entered.**

Fig. 25

2) Input the film speed.

- Press the film speed selector button ② to display the film speed on the indication panel. (Fig. 25)
- Stop the blinking of the film speed indication by pressing the "SET" button ③. (Fig. 25)
- If the "SET" button is not pressed at this time, the blinking continues for 10 sec.; then the warning tone sounds, and the indicator returns to the previously selected film speed.
- The range of film speed indication 6 ~ 6400 ISO/ASA.

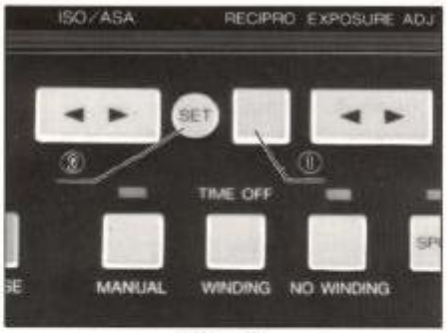


Fig. 26

3) Input the film characteristics.

- Press the "RECIPRO" button ① to indicate the exposure adjustment on the indication panel. (Fig. 26) See the reference tables provided.

★ **As the exposure adjustment indicator blinks like the film speed indicator, press the "SET" button ② to stop the blinking. (Fig. 26)**

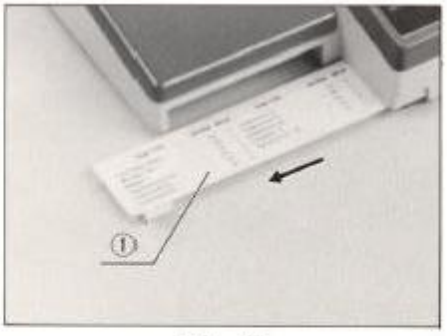


Fig. 27

★ **Data of these often used films are imprinted on an instruction slider ① beneath the control panel. (Fig. 27)**

- Data entered into the control panel are backed up by built-in batteries to remain in memory for about 7 years even after switching off the power switch or during power failure.

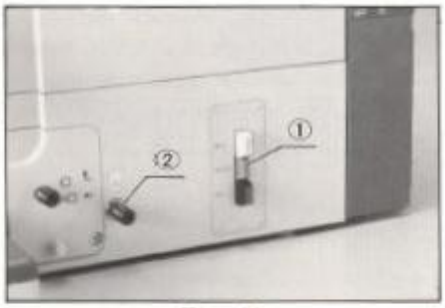


Fig. 28

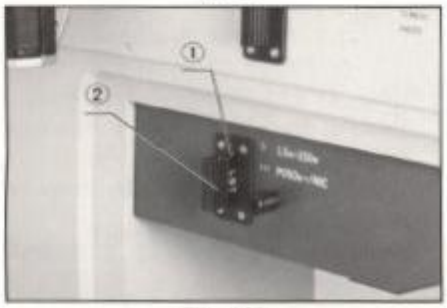


Fig. 29

Fig. 30

Fig. 31

Fig. 32

4. **Filter selection**

When the low voltage selector switch "PHOTO" ① is pressed, and the LBD filter ② is engaged, this microscope is designed to render optimum color temperature illumination for daylight-type color film. (Fig. 28)

1) In case of daylight-type color film

Ascertain that the LBD filter ② is pushed in and other filters are pulled out. (Fig. 28)

2) In case of tungsten-type color film

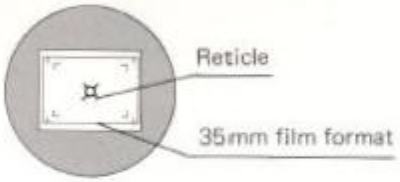
- Pull out the LBD filter ②. (Fig. 28)
- Mount the LBT filter ② into the additional filter slot ①. (Fig. 29)

3) In case of B&W film

- Pull out the LBD filter ②. (Fig. 30)
- Pull out the contrast filter knob "G" or "O" ③ (Fig. 30), and insert other filters into the additional filter slot.

5. **Framing**

Frame the specimen image within the 35 mm frame reticle.



1) To change the image magnification, rotate the photo eyepiece selector knob ① or change the objective magnification. (Fig. 31)

*Magnification on film plane = Objective magnification X Photo eyepiece magnification

2) To change the orientation of a specimen, rotate the stage.

6. **Focusing**

1) Rotate the diopter adjustment ring ① on each eyepiece with the eye on that side, until the cross lines in the center of the field of view are distinctly resolved as 2 lines. (Fig. 32)
*Repeat this adjustment on the other eyepiece.

2) Make sure that the images of the reticle and the specimen are sharply focused simultaneously by means of the coarse and fine adjustment knobs.
*Since the double cross lines in focus and the film plane are in precise alignment, the image focused through the eyepieces and the image on the film plane are in focus at the same time. Therefore, unless the diopter adjustment just described is perfect, blurred pictures will result no matter how well the specimen may be brought in focus visually.

Fig. 33

3) When employing objectives 10X or lower, accurate focusing is fairly difficult because of their considerable depth of focus. In such a case, push down the focusing magnifier lever ① to enter into the light path. As the image magnification is increased by approx. 4X, accurate focusing can be more easily achieved. (Fig. 33)

Fig. 34

7. Exposure

1) Ascertain that the SAFETY light ① is lit up green. (Fig. 34)

- If it blinks red . . . . . Reduce intensity with the intensity control knob.
- If it continues in red . . . . Increase intensity with the intensity control knob.
- If it does not light up . . . "MANUAL" or "LOCK" is engaged; disengage.

2) Set the exposure adjustment button ② according to the distribution of the specimen.

- If highly transparent objects are spread evenly throughout a bright field, set the button to "1". (Fig. 34)
- If they are unevenly spread, refer to page 33.

3) Pull out the 100%-light-to-camera knob ⑧ for dark objects or fluorescent light photomicrography. (Fig. 35)

4) Make sure that no button for special applications is illuminated:
③ MANUAL ④ SPOT MEAS.
⑤ LOCK ⑥ NO WINDING

5) Press the shutter release button (EXPOSE) ⑦.
The WORK lamp lights up while the shutter is open, and goes out at the end of exposure, advancing the film one frame. (Fig. 34)

Fig. 35

8. End of film roll

1) As soon as all the frames in a roll have been exposed, the film advance motor stops, and the frame counter indicator blinks, giving a warning beep for 3 sec.

2) Turn the rewind release clutch ① by 90°, counterclockwise. (Fig. 36)

3) Fold out the rewind crank ② and wind it slowly and evenly in the direction of the arrow (clockwise). (Fig. 36) While rewinding, you will feel tension. When the tension stops and the crank turns freely, the film has been completely rewound back into the cartridge.
★ **The rewind release clutch will automatically return to its original position after the film has been completely rewound.**

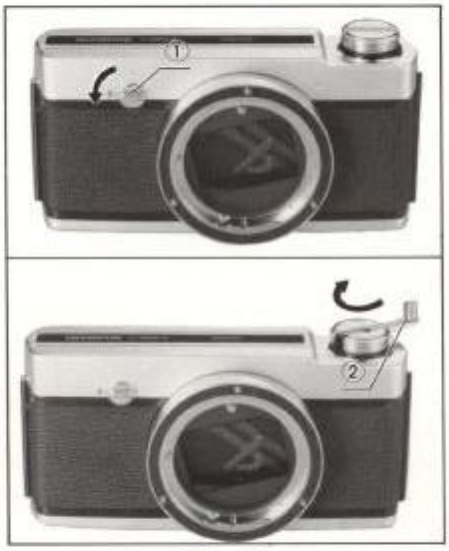
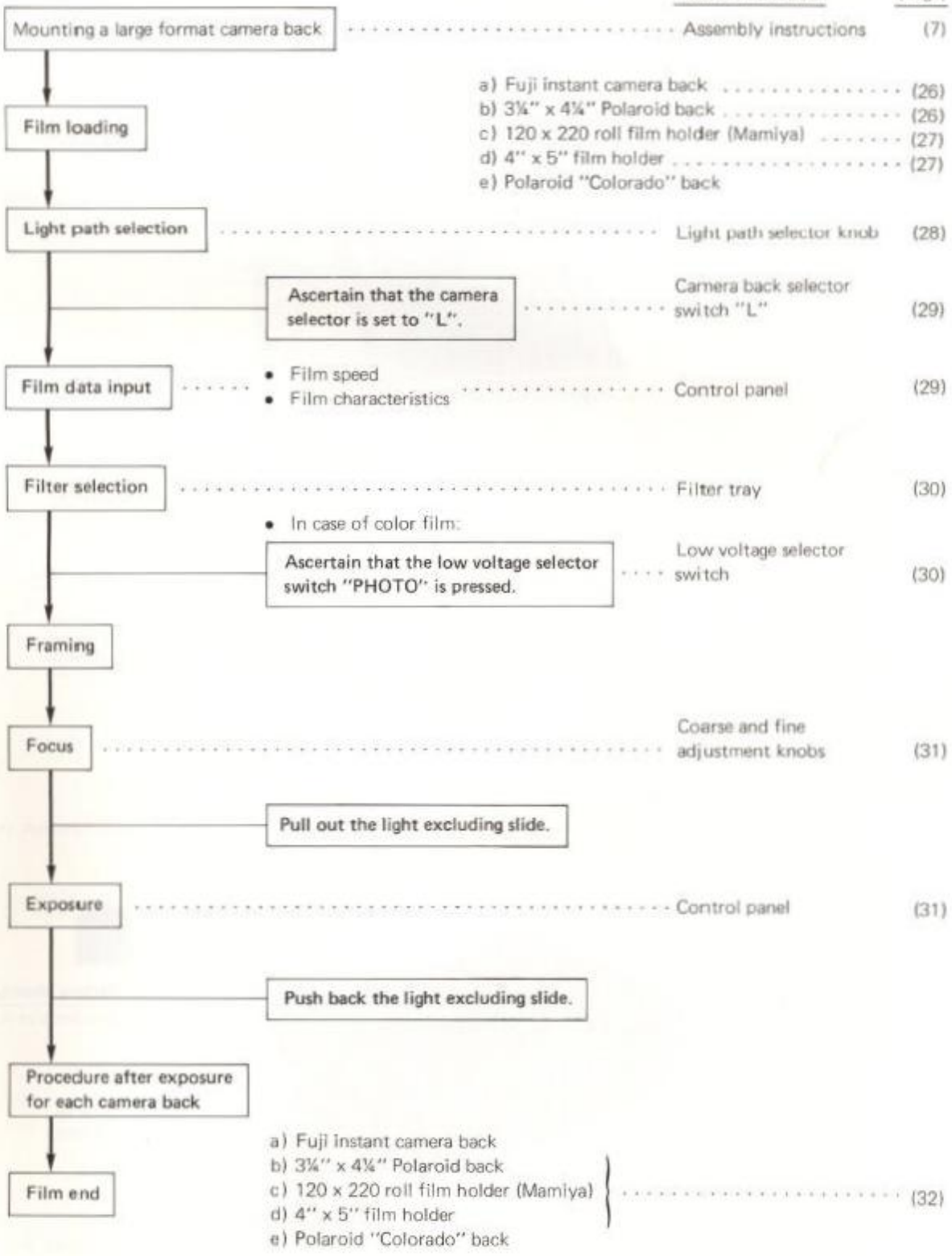


Fig. 36

C. Summary of Large Format Photomicrography


Relevant Section
(Page)
Mounting a large format camera back
Assembly instructions (7)
Film loading
a) Fuji instant camera back (26)
b) 3¼" x 4¼" Polaroid back (26)
c) 120 x 220 roll film holder (Mamiya) (27)
d) 4" x 5" film holder (27)
e) Polaroid "Colorado" back
Light path selection
Light path selector knob (28)
Ascertain that the camera selector is set to "L".
Camera back selector switch "L" (29)
Film data input
• Film speed
• Film characteristics
Control panel (29)
Filter selection
Filter tray (30)
• In case of color film:
Ascertain that the low voltage selector switch "PHOTO" is pressed.
Low voltage selector switch (30)
Framing
Focus
Coarse and fine adjustment knobs (31)
Pull out the light excluding slide.
Exposure
Control panel (31)
Push back the light excluding slide.
Procedure after exposure for each camera back
Film end
a) Fuji instant camera back
b) 3¼" x 4¼" Polaroid back
c) 120 x 220 roll film holder (Mamiya)
d) 4" x 5" film holder
e) Polaroid "Colorado" back
(32)

○ Adapter for large format camera backs

This adapter is required for all types of large format camera backs.

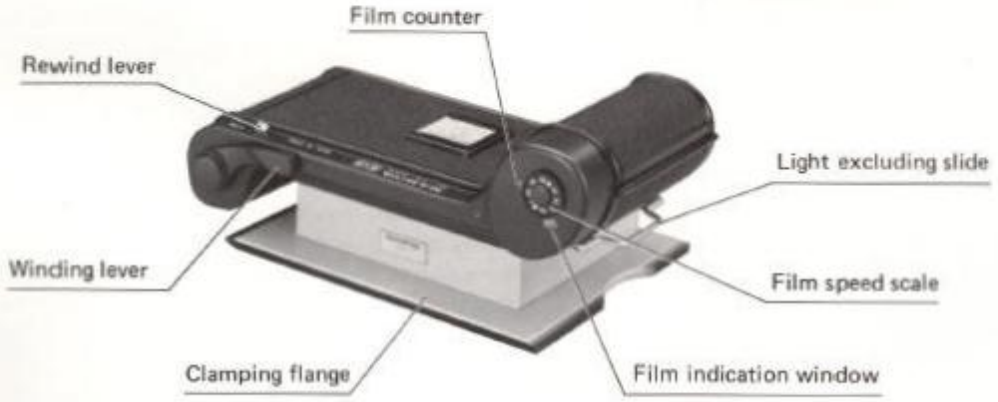
Mount for large format camera back
Clamping ring
Connects the adapter to the microscope.
Clamping latch
Clamps a large format camera back to the adapter.
Relay lens
Screw-in type. Removable by unscrewing and convenient for cleaning the lens surface.

■ Large Format Camera Backs

a) Fuji instant camera back PM-CFI

b) 3¼" x 4¼" Polaroid camera back PM-CP

d) 120x220 roll film holder (Mamiya) PM-CMH



e) Adapter for 4"x5" holders PM-C4x5

★ Be sure to use film holders that comply with the international standards for 4" X 5" film holders.

1. **Film loading**

a) Fuji instant camera back

- Picture size: 97 X 102 mm
- Film used: Fuji instant color film FI-10 (ISO/ASA 160)

■ **Insert the batteries.**

1) Insert four 1.5V alkaline-manganese batteries size AA into the battery chamber. Follow the directions given inside the chamber for battery polarity.
2) Other manganese or Ni-Cd batteries of the same rating can be used.

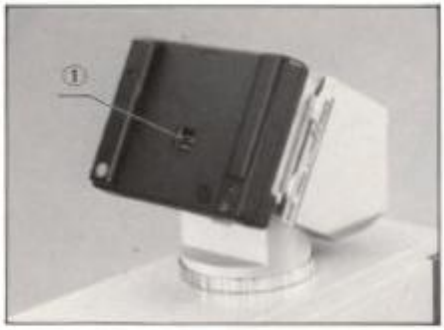


Fig. 37

■ **Load the film.**

1) Open the film case and take out the film pack.
2) Push the cover release button ① in the direction of the arrow mark engraved on the cover, and open the cover. (Fig. 37)
3) Aligning the orange line of the pack to that of the back, push the pack into the camera until it snaps into place.
4) As you press the release button of the back, the light excluding slide of the pack will be automatically advanced.

The camera back is now ready for taking pictures.

b) Polaroid camera back*

- Picture size: 3¼" X 4¼" (73 X 95 mm)
- Film used: Polaroid type 668 (color, ISO/ASA75)
  Polaroid type 667 (B&W, ISO/ASA3000)

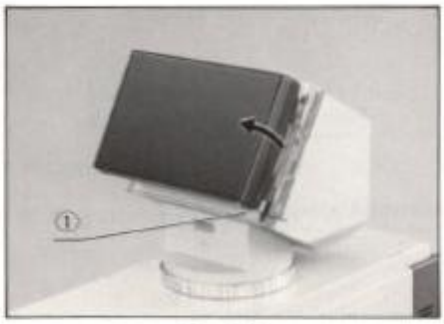


Fig. 38

■ **Load the film.**

*Read the instructions inserted in the film pack first and then take the following steps:

1) Open the film box and take out the film pack.
2) Push the cover locking latch ① upwards with both hands. (Fig. 38)
3) Open the camera back cover all the way.

★ **Handle with care so as not to break the cover.**

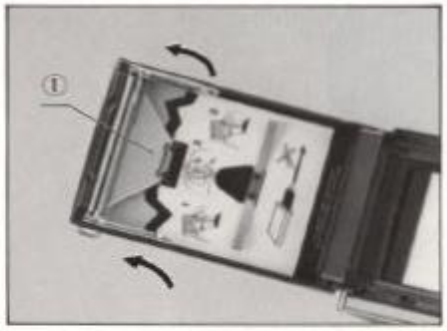


Fig. 39

◎ It is essential to keep the rollers clean, for dirty roller will produce irregularities on the picture.

1) To clean the rollers, lift the roller unit ① upwards and remove. (Fig. 39)
2) Wipe the rollers first with a wet cloth and then with a dry cloth.
3) After cleaning, place the roller unit in its original position.

★ **Do not scratch the roller surface with finger nails or sharp metallic objects.**

* Polaroid is the registered trademark of Polaroid Corporation, Cambridge, Mass., U.S.A.

Fig. 40

4) Next, holding the film pack only by the edges, so that the safety cover, bearing the legent "SAFETY COVER... THIS SIDE FACES LENS", faces into the camera, insert the pack against the spring beneath the back cover. (Fig. 40)
5) Push the pack into the camera until it snaps into place.
*Make sure that the white tabs are not caught between the pack and the camera body.
6) Close the camera back cover pressing both sides of the cover tightly. The black tab of the safety cover should protrude from the small slot; if this is not the case, open the back cover once again and make sure that the black tab is sticking out.
7) After the black cover is pulled out, a white tab should emerge from the slot. Pull this white tab only after having made an exposure.

This concludes the preparation for photography.

c) 120 X 220 roll film holder (Mamiya)

- Picture size: 60 X 90 mm
- Film used: Brownie film 120 (8 frames); 220 (16 frames)

Insert the film pack into the film holder according to the instructions provided with the film package.

Fig. 41

d) Adapter for 4" X 5" holders

Use of this unit permits photography with 4 X 5 film holders.
The film holders available are 4" X 5" Polaroid film holder type 550, 545, and others; Graphmatic film holders; Graphic pack adapter; Graphic film holder (Rite Way), Linhof film holder, etc. The above mentioned film holders are not Olympus products. They can be obtained either from our authorized distributors or from reputable camera dealers.

■ **Attach the film holder.**

1) Slide the lock buttons (both sides) of the adapter in the direction opposite to locking. At the end of their travel press the buttons. (Fig. 41)
The clamping device will lift up.
★ **This procedure varies depending upon the type of film holders. (Fig. 42)**
2) Insert the film holder all the way. This will engage a projection on the film holder with a mating groove on the adapter.
★ **In case of the graphmatic film holder, insert the holder into position without lifting up the clamping device.**
3) Clamp the film holder down with the lock buttons.

Fig. 42

© To detach the holder:

1) Slide the lock buttons on both sides in the direction opposite to locking.
2) Pull the holder out while lifting it lightly. (Fig. 43)
This way, it will slide out easily.

Fig. 43

■ **Load the film.**

Follow the instructions provided with each film holder in use that comply with the international standard of 4" X 5" film holders.

Fig. 44

2. **Light path selection**

1) Push the right hand light path selector knob ① all the way to "PHOTO.MEAS". (Fig. 44)

Fig. 45

2) Push the left hand light path selector knob ② all the way to "TV.MEAS". (Fig. 45)

3) Looking through the eyepieces, you can see the frame reticles. These reticles will be explained in paragraph of "Framing" page 30.

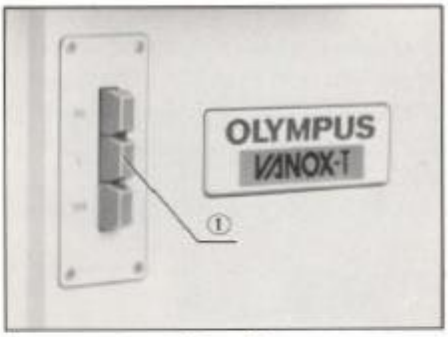


Fig. 46

3. Film data input (common to all the large format camera backs)

1) Press the camera back selector switch "L" ①. (Fig. 46)

Fig. 47

2) Enter the film speed.

Press the film speed button ② until the film speed as desired appears in the indicator panel (Fig. 47)
While the film speed indicator is blinking, press the "SET" button ③ to stop blinking. (Fig. 47)

★ If the "SET" button is not pressed, a warning beep sounds after 10 sec. blinking, then the indicator returns to the previously entered value.

- The range of film speed indication is from 64 to 6400 ISO/ASA.

Fig. 48

3) Input of film adjustment value.

Press the reciprocity failure compensation button ① to display the adjustment value (Fig. 48) according to the tables on the leaflet provided.

- While the indicator of the adjustment value is blinking, press the "SET" button ② to stop blinking. (Fig. 48)

★ Data for these often used films are imprinted on the instruction slider ① beneath the control panel. (Fig. 49)

- Data entered into the control panel are backed up by the built-in batteries to remain in memory for about 7 years even after switching off the power.

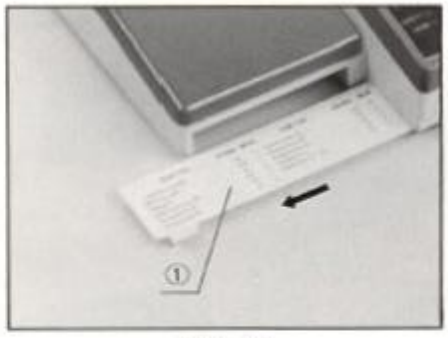


Fig. 49

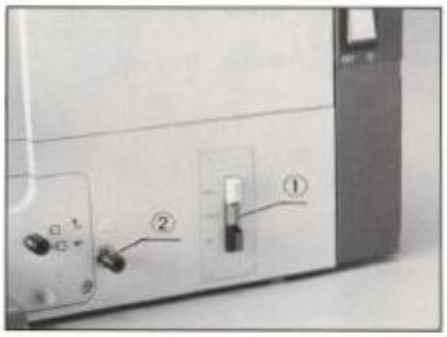


Fig. 50

4. **Filter selection**

This microscope is capable of rendering the illumination of the color temperature most suitable for daylight type color film, by setting the low voltage selector switch ① to the "PHOTO" position and engaging the LBD filter ②. (Fig. 50)

1) For daylight-type color film

Ascertain that the LBD filter ② is pushed in, and the other filters are pulled put. (Fig. 50)

Fig. 51

2) For tungsten-type color film

- Pull out the LBD filter ②. (Fig. 50)
- Insert an LBT filter, provided, into the additional filter insertion slot ①. (Fig. 51)

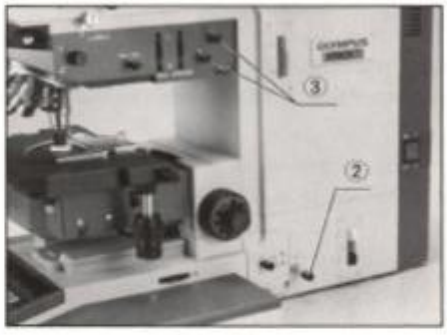


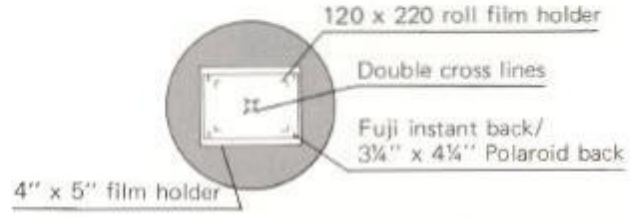
Fig. 52

3) For B&W film

- Pull out the LBD filter ②.
- Pull out the contrast filter knob "G" or "O" (Fig. 52), and insert other filters into the additional filter slot.

5. **Framing**

Bring the portion of the specimen to be photographed within the frame reticle in accordance with the camera back in use.



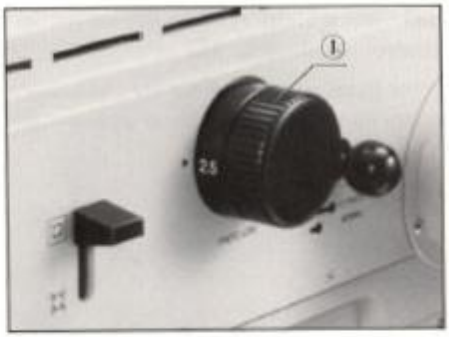


Fig. 53

1) If the image magnification of the specimen is not appropriate as desired, adjust it by means of the magnification selector knob ① or the OBJECTIVE button. (Fig. 53)

*Image magnification = Objective magnification X
Photo eyepiece magnification X 3
(for large format backs)

2) If it is necessary to change the orientation of the specimen, rotate the stage.

Fig. 54

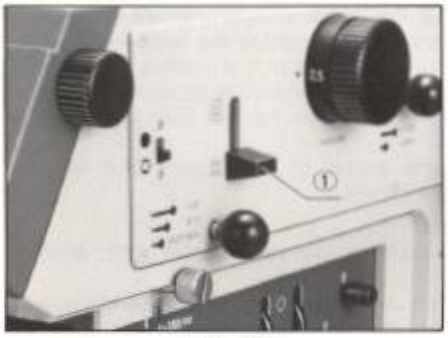


Fig. 55

Fig. 56

Fig. 57

6. Focusing

1) Turn the diopter adjustment ring ① on the eyepiece in such a manner that the double cross lines within the field of view can be clearly recognized as two lines (Fig. 54)

*Repeat this procedure for the other eyepiece.

2) Since the double cross lines are in focus and the film plane is in precise alignment, the image focused through the eyepieces and the image on the film plane are in focus at the same time. Therefore, use the coarse and fine adjustment controls of the microscope to bring the specimen in focus. Check again to make sure that both the double cross lines and the specimen are equally sharp in focus.

3) Accurate focusing with objectives 10X or lower is fairly difficult because of their considerable depth of focus. In such a case, push the focusing magnifier lever ① down to engage it in the light path. (Fig. 55)

★ **Since the image magnification is enlarged approx. 4X by means of the focusing magnifier, accurate focusing is made easier. (Fig. 55)**

7. Exposure

1) Ascertain that the SAFETY light ① is lit up green. (Fig. 56)

- If it blinks red . . . . . Reduce intensity with the intensity control knob.
- If it continues in red . . . . Increase intensity with the intensity control knob.
- If it does not light up . . . "Manual" or "LOCK" is engaged; disengage.

2) Set the exposure adjustment button ② according to the distribution of the specimen.

- If highly transparent objects are spread evenly throughout a bright field, set the button to "1". (Fig. 56)
- If they are unevenly spread, refer to page 33.

3) Pull out the 100%-light-to-camera knob ⑦ for dark objects or fluorescent light photomicrography. (Fig. 57)

4) Make sure that no button for special applications is illuminated: ③ MANUAL ④ SPOT MEAS. ⑤ LOCK (Fig. 56)

5) Press the shutter release button (EXPOSE) ⑥.
The WORK lamp lights up while the shutter is open, and goes out at the end of exposure. (Fig. 56)

8. Procedure after exposure

a) **Fuji instant camera back**

1) Press the advance button of the camera back to push out the exposed film.
2) Normally, the picture image appears in about 15 sec., and fixes in about 1 minute.
3) After the pack is completely exposed (10 frames), replace it with a new one.
   - ★ **When the camera back is clamped properly, its film counter will be positioned upside down.**
   - ★ **Pull out the film, with care not to touch the picture area, but by holding only the edges.**

b) **3¼" X 4¼" Polaroid camera back**

1) After exposure, hold the white tab emerging from the camera with thumb and index finger of the right hand and pull it out completely in one steady motion.
   - ★ **If the yellow tab is in sight, do not pull the white tab. Pulling out the white tab does not mean commencement of development; it is a preparatory step for pulling the yellow tab.**
2) Hold the center of the yellow tab and pull it out from the camera quickly in one motion. This is the beginning of development. It starts from the point where the yellow tab has been pulled out all the way.
   - ★ **If countless white spots appear in the picture, pull out the yellow tab a little more slowly.**

c) **120 X 220 roll film holder**

1) After pushing the film winding release lever to the right, wind up the film.
2) When the entire roll of film is exposed, rewind the entire film with the rewind lever, then open the rear cover and replace the film.

d) **4" X 5" film holder**

Follow instructions provided with each holder in use.

Fig. 58

D. Special Applications

The special applications introduced here can help to produce improved photomicrographs under certain conditions.

1. **Average exposure measurement for distribution of specimen**

Exposure can be adjusted using the adjustment button ① for a wide range of specimen contrast patterns. For example, only small portions of specimen exhibit intense brightness, e.g. dark field of fluorescence illumination, etc., or low contrast chromosomes in bright field illumination, etc. (Fig. 58)

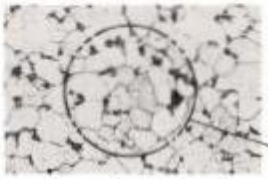
★ **Specimen conditions and exposure control with ISO/ASA 100 film**

Speciman condition	Position of exposure adj.	ISO/ASA rating	Exposure variation
Objects spread in bright field	0.5	50	1 full stop over
Objects are spread throughout the field	[1]	100	Normal
Objects spread in dark field	2	200	1 full stop under
Objects scattered thinly in dark field	*4	400	2 full stops under

- The exposure adj. button is adjustable in increments of 1/3 stops.

★ **If the entire adjustment range of the exposure adj. button is insufficient, use the film speed button, for additional correction.**

Exposure adjustment: "0.5"



"[1]"

"4"

★ **An average measurement is performed in the central integrated measurement area (18 mm diameter) on 35 mm film plane.**

Fig. 59

2. Spot exposure measurement

1) Press the spot measurement button ① and ascertain that the working light located above the button is blinking. (Fig. 59)

2) Bring the specimen detail to be photographed into the spot measurement area.

★ **From the standpoint of framing the picture, if the specimen detail is not supposed to be in the spot area or in case of a specimen quick to fade, the use of the LOCK button is recommended. (Read page 35 for use of the LOCK button.)**

3) Set the exposure adjustment button (EXPOSURE ADJ.) according to the distribution of the specimen. Manual exposure adjustment is necessary even in spot measurement, unless the spot area is completely filled with the specimen. Refer to the table below as guideline:

Photo-micro-graphy	Film speed adjustment factor		Reciprocity compensation factor	Exposure adjustment for distribution of the specimen	
	Reversal film	Negative film		Object area in the circle inscribed in the reticle	EXPOSURE ADJ.-setting: Darkfield / Brightfield
Fluore-scence	4X (Ex. 400 for ISO/ ASA 100)	2X	Set the RECIPRO. setting as designated in the INSTRUCTION SHEET. Standard setting: 1X	Over 100%	1 / 1
				Abt. 50%	2 / 0.80
				Abt. 25%	4 / 0.64
General	1X	1X		Under 25%	Set the film speed button to the higher speed more than 1 step. (Ex. 400→500) / 0.5

Range of the automatic light measuring capacity

The Model AHBT has the same light measuring range for both spot and integrated measurements.

The minimum exposure time is 0.01 sec., but the maximum exposure time varies depending upon the setting of the RECIPROCITY dial and the ASA rating of film in use.

RECIPROCITY dial	ISO/ASA rating (35 mm film)						ISO/ASA rating (large format film)				
	6 – 200	400	800	1600	3200	6400	64 – 1600	3200	6400	6400 X 2	6400 X 4
0		17.0 m.	8.5 m.	4.2 m.	2.1 m.	1.0 m.		21.5 m.	10.7 m.	5.3 m.	2.6 m.
1			16.0	6.9	3.2	1.5			18.8	8.8	4.1
2			25.7	11.0	4.9	2.1				14.3	6.3
3				17.7	7.5	3.0				23.6	9.8
4	30 min ~ 99.9 hrs.			28.7	11.6	4.4	30 min ~ 99.9 hrs.				15.3
5					17.7	6.3					23.8
6					27.0	9.2					
7						13.3					

★ **If the exposure time required for a particular specimen extends beyond the max. limit, expose in manual mode.**

3. **Manual exposure mode**

Exposure time can be selected manually without utilizing the automatic exposure system. This enables you to choose exposure times yourself, including long exposures beyond the limits of the auto exposure range.

1) Press the MANUAL button ① to make sure the working light is blinking. (Fig. 60)
2) Press the shutter release button (EXPOSE). The shutter will open and the running elapsed exposure time is displayed on the indicator panel ②.
3) When the necessary exposure time is attained on the indication panel, press the TIME OFF button ③ and the shutter closes. (Fig. 59)

Fig. 60

4. **Use of the automatic exposure lock button (LOCK)**

In the automatic mode, pressing this button enables the user to lock the exposure time (estimated exposure time or actual exposure time) as shown on the LED display.
As the LOCK button is pressed, the red light above the LOCK button flashes, indicating the exposure time is locked, and that the film will be exposed in the semi-automatic exposure mode due to the built-in memory device. Pressing the button again releases the LOCK mode.

1) Panorama photography

If the same specimen is exposed repeatedly in different positions or adjacent specimen areas are photographed and mounted to obtain panorama photography, it is recommended to assure constant background rendition and specimen contrast of each frame by shooting at constant exposure time. Select the area where the specimen details are evenly spread, and engage the LOCK.

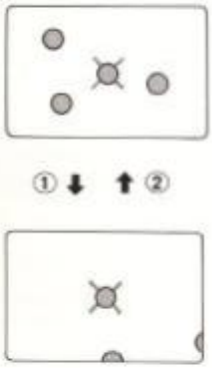


Fig. 61

2) Combination use of the LOCK with spot measurement

If the portion of the specimen, subject to spot measurement, is not in the center of the field because of your desired framing or composition, engage the LOCK as the portion of the specimen to be photographed is brought into the center, then reframe it as desired, before exposure. (Fig. 61)

3) Photomicrography at or close-to-max. exposure time

If the specimen requires the max. or close-to-max. exposure time (refer to the table of Max. Exposure Time above) (e.g. in fluorescence, etc.) on auto mode the LED display sometimes changes into "underexposure" during the exposure time and the shutter does not close. To avoid this phenomenon, the LOCK is recommended.

Fig. 62

5. **Multiple exposures of 35 mm film**

Multiple exposures of the same frame can be made by releasing the automatic film advance system in the following way:

1) Press the multiple exposure button (NO WINDING) ① and ascertain that the light is blinking. (Fig. 62)
2) Release the shutter for multiple exposures as many times as you wish without film advance.
   ★ **It is recommended to set the film speed at a higher value and reduce exposure time so that overexposure can be avoided.**
3) To advance the film, press the NO WINDING button ① again after multiple exposures are completed.

6. Large format photomicrography at film speed settings lower than ISO 64

The Model AHMT principally permits the film speed settings as low as ISO 64 for large format photography, which, however, can be further extended to ISO 6 by means of manual exposure adjustment and by use of the built-in ND filters.

1) In the case of film speed settings at ISO 50, 40 and 32

These low film speeds can be obtained by setting the exposure adjustment button as follows: Press the film speed button to ISO 64 (see p. 20), and then press the exposure adjustment button (p. 19) to manually set the exposure time according to the desired film speed as given in Table 1.

Film speed	Exposure adjustment setting
ISO 50	0.80
ISO 40	0.64
ISO 32	0.50

Table 1

2) In the case of film speed settings at ISO 25, 12 and 6

These further lower speeds can be obtained in the following 2 methods: (A) by use of the built-in ND filters, and (B) by means of manual exposure adjustment.

A. By the built-in ND filters

1) Press the exposure adjustment button to ISO 50 as mentioned above.
2) Press the AE (auto exposure) lock button.
3) Adjust the light intensity control knob (p. 7) to engage the built-in ND filters according to the film speed as given in Table 2.

Film speed	Exposure variation by exposure adj.
ISO 25	1 full stop over
ISO 12	2 full stops over
ISO 6	3 full stops over

Table 2

B. Manual exposure adjustment

1) Press the exposure adjustment button to ISO 50 as mentioned above.
2) Press the MANUAL button (p. 16) in the following manner: Read out the estimated exposure time displayed on the indication panel on auto exposure mode, prior to pressing the MANUAL button; then multiply the estimated exposure time by the exposure factor obtained from Table 3, and expose on Manual mode.

Film speed	Exposure factor
ISO 25	2 X
ISO 12	4 X
ISO 6	8 X

Table 3

★ **Generally speaking, large format photomicrography involves the lens-and-film-plane distance longer than 35 mm photomicrography, which reduces the light amount to reach the film plane. On the other hand, it is possible for the large format film to obtain a sharper photograph. Accordingly a high speed film is recommended for large format photomicrography as much as possible.**

OLYMPUS OPTICAL CO.,LTD. SAN-EI BUILDING, 22-2, NISHISHINJUKU
1-CHOME, SHINJUKU-KU TOKYO, JAPAN